REMARKS

Claims 1-6 are pending in the present application. Claim 5 has been amended to delete indefinite subject matter. New claim 6 has been added and is directed to the subject matter canceled from claim 5. No new matter has been added by way of the above amendments.

Issues under 35 USC § 112

Claim 5 has been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Applicants have amended claim 5 to cancel the "such as" language. Therefore, Applicants request that the rejection be withdrawn.

Issues under 35 USC § 103

Claims 1-5 have been rejected under 35 U.S.C. 103(a) as being unpatentable over GB 2 355 016 A. This rejection is respectfully traversed. Reconsideration and withdrawal thereof are requested.

Invention of claims 1, 2, 5 and 6

In one aspect of the present invention, a lead-free copper-based sintered alloy is characterized by the following properties:

1. The composition contains 1-30 mass % of Bi;

2. The composition contains 0.1-10 mass % of hard particles which have an average particle diameter of 10-50 μm;

3. The composition (as recited in claim 2) contains at least one of:
    a. 1-15 mass % of Sn;
    b. 0.1-5 mass % of Ni; and
    c. 0.5 mass % or less of P; and
4. The Bi phase has smaller average particle diameter than the hard particles.

In the sintered alloy of GB '016, the composition contains 1-20 mass % of Bi, which have a preferred grain size of "not more than 250μm" (page 9, lines 10-12). The hard particles are present at 0.1-10 vol % and have a particle size of 1-45 μm. The rejection relies upon the statement in GB '016 that "Bi is prevented to flow out from its initial position through coexisting hard particles" as evidence that feature (4) of the invention, as listed above, is met. Presumably, the Examiner interprets this statement to mean that the hard particles hold the Bi particles in place, and therefore the reference teaches that the hard particles must be larger than the Bi particles in order for this to occur. However, this interpretation of the meaning of that statement is incorrect.

As can be seen in Fig. 2 of GB '016, the skilled artisan would clearly be directed to employ Bi phase particles which are larger than the hard particles, since the Bi phase particle surrounds the hard particle in the cross sectional view of the two particles in the copper alloy matrix. The description further elaborates on this concept by explaining how it is necessary for the hard particle to embed in the "soft Bi-phase" (page 4, line 2). By catching or embedding the

hard particles, the larger Bi-phase particles prevent the hard particles from "excessively attacking the mating member at the sliding contact surface because of cushioning property of the soft Bi-phase as shown in Fig. 2" (page 3, line 25 to page 4, line 2).

In searching for guidance as to the relative sizes of the Bi-phase particles and the hard particles, the skilled artisan is also directed by the description at page 5, lines 11-16 of GB '016. There, referring to the hard particles, it is stated:

> If the average grain size exceeds 45 μm, in the case *where the Bi amount is relatively smaller*, there can not be seen the effects of Bi-phase which are properties of cushioning and embeddability for hard particles and the hard particles attack the mating member more intensely.

Thus, one of ordinary skill in the art would be motivated to use Bi-phase particles which are larger than the hard particles since the use of smaller Bi-phase particles prevent the cushioning of the hard particles, thereby allowing them to attack the mating member

Assuming that a *prima facie* case of obviousness has been established by the teaching of GB '016, which Applicants do not concede, MPEP 2144.05 provides:

> A prima facie case of obviousness may also be rebutted by showing that the art, in any material respect, teaches away from the claimed invention. In re Geisler, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997). MPEP 2144.05 sec. III.

Since GB '016 does not specifically describe the relative sizes of the Bi-phase and hard particles, the skilled artisan would look to the reference as a whole to determine what was intended. In doing so, Fig. 2 and the description at pages 3-5 as discussed above would provide motivation to use Bi-phase particles which have a larger average particle diameter than that of the hard particles since the reference teaches away from using Bi-phase particles which have a smaller average particle diameter relative to the hard particles. Further, when the statement which formed the basis of the rejection ("Bi is prevented to flow out from its initial position through coexisting hard particles") is placed in context, the skilled artisan would readily see that the intent of this statement was to describe how the hard particle should embed in the soft Bi-phase, thereby allowing the larger Bi-phase particles to prevent the hard particles from attacking the mating member at the sliding contact surface.

Accordingly, claims 1, 2, 5 and 6 are not obvious in view of GB '016, and Applicants request that the rejection be withdrawn.

Invention of claims 3-6

In another aspect of Applicants' invention, a lead-free copper-based sintered alloy is characterized by the following unique properties:

1. The composition contains 1-30 mass % of Bi;
2. The composition contains 0.1-10 mass % of hard particles which have an average particle diameter of 10-50 μm;
3. The composition (as recited in claim 4) contains at least one of:
    a. 1-15 mass % of Sn;

b. 0.1-5 mass % of Ni; and

c. 0.5 mass % or less of P; and

4. The hard particles having 50% or less of a contact length ratio with the Bi phase based on the total circumferential length of the hard particle, which is in contact with the Bi phase, are present in a ratio of 70% or more based on the entire number of the hard particles.

With regard to the 4th property above, the rejection relies on an inherency argument, with the Examiner stating "since the sintered alloy of GB '016 has an overlapping composition and is made using a similar method as the sintered alloy of the present invention, it would be expected that the sintered alloy of GB '016 would have an overlapping contact length ratio and hard matter particle ratio." However, Applicants assert that the skilled artisan in possession of GB '016 would not expect this feature of the invention to be inherent in the alloy as it is described therein.

As Applicants point out in the specification, a hard particle contact ratio of 100% means that one or more hard particles are in contact with a particular Bi phase at the entire periphery of the hard particle. In other words, the hard particle is imbedded in, or enveloped by the Bi phase. When the contact ratio is less than 100% but greater than 0%, a portion of the hard particle protrudes out from the Bi phase and is in contact with the copper alloy. According to Applicants' invention, the hard particle contact ratio is 50% or less which decreases the contact between the hard particle and the Bi phase. Additionally, the "presence ratio of hard particles" must be 70% or more. When a presence ratio of hard particles is 100%, all of the hard particles have a contact ratio of 50% or less. When the presence ratio of hard particles is 0%, all of the

hard particles have a contact ratio of more than 50%. Applicants' invention limits the presence ratio of hard particles to 70% or more.

Although GB '016 does not specifically describe any value which corresponds to Applicants hard particle contact ratio and presence ratio of hard particles, the skilled artisan could see from Fig. 1(a) that these values would be outside the scope instantly claimed. Applicants have indicated on the attached copy of Fig. 1(a) from GB '016 where the hard particle contact ratio is large or small. P_s represents hard particles which have 50% or less of a contact length ratio with the Bi phase based on the total length of the hard particle. The "s" indicates that the contact ratio is small. Similarly, P_ℓ represents hard particles which have more than 50% of a contact length ratio with the Bi phase based on the total length of the hard particle, with the "l" indicating that the contact ratio is large. According to Fig. 1(a), $P_s/(P_\ell+P_s) < 50\%$, and thus, the teaching of GB '016 does not satisfy the Applicants' claimed requirement that this value be greater than or equal to 70%. Since this evidence undermines the inherency argument which forms the basis of the rejection of claims 3 and 4 under 35 USC § 103, Applicants assert that the rejection over GB '016 is improper.

The rejection also states Applicants requirement that hard particles having 50% or less of a contact length ratio with the Bi phase based on the total circumferential length of the hard particle, which is in contact with the Bi phase, are present in a ratio of 70% or more based on the entire number of the hard particles is inherent in the teaching of GB '016 since the sintered alloy of GB '016 is allegedly made using a similar method as is used in making the sintered alloy of Applicants' invention. However, as can be seen at paragraph [0017] of the invention, when the sintering process was carried out over a long period of time, the result was the promotion of the

diffusion of the Bi phase, thereby producing the comparative samples which were outside the scope of the invention which carried out the sintering process over a shorter period of time. The sintering process of GB '016 occurred over the course of 20 min. (page 9, lines 24-27) which is longer than the sintering process of the invention. Therefore, the sintered alloy of GB '016 was not made by a similar method to what was used by Applicants in preparing the sintered alloy of the invention.

Inasmuch as GB '016 does not make the claimed invention prima facie obvious for the reasons set forth above, the rejection of claims 1-5 under 35 U.S.C. 103(a) over this reference should be withdrawn.

Provisional Double Patenting Rejection

Claims 1-5 have been rejected under the judicially created doctrine of obviousness-type double patenting over claims 1-4 of U.S. Patent Application. No. 11/148,186.

Applicants respectfully refer the Examiner to MPEP § 804 I.B. which states that:

> If the "provisional" double patenting rejections in both applications are the only rejections remaining in those applications, the examiner shouldthen withdraw that rejection in one of the applications (e.g., the application with the earlier filing date) and permit the application to issue as a patent. The examiner should maintain the double patenting rejection in the other application as a "provisional" double patenting rejection which will be converted into a double patenting rejection when the one application issues as a patent.

Conclusion

In view of the above amendments and Remarks, applicant believes the pending application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Marc S. Weiner, Reg. No. 32,181 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

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Attachment: Figure 1A